Radiological Assessment for Cabot Corporation Revere, PA Site

Additional Information Needed to Support the Dose Assessment

1. The presence of radioactive slag under the former warehouse/loading dock area cannot be ruled out based upon the site characterization completed to date. Given that part of the area is paved and part is beneath a structure, gamma surveys performed on the site are considered inconclusive. Therefore, a basis for classifying this as an unaffected area needs to be provided.

2. Staff does not believe that it is appropriate to assume that a cover will be permanently maintained over the slag without active maintenance. Thus, the assumption of a permanent soil cover will require some form of restrictions on the land use. Given the significance of this assumption on the calculated dose, Cabot needs to either provide a basis to support this assumption or eliminate it in their assessment.

3. Staff does not agree an appropriate basis for excluding the agricultural pathway has been provided. First, it is not clear why Cabot believes that it is reasonable to assume that someone would haul in topsoil to grow grass, but would not haul in topsoil to maintain a small garden. Second, with suitable fertilizers or soil amendments, plants can be grown in "soil free" material such as mineral sand, gravel, etc.; however, this seems less likely to occur than someone bringing in topsoil to grow a small garden. Consequently, the absence of soil does not constitute a sufficient basis for eliminating the plant-ingestion pathway. Staff's own assessment shows that inclusion of the plant-ingestion pathway has a significant effect on the calculated dose. Therefore, Cabot should either provide a stronger basis for eliminating the plant-ingestion pathway or should include it in the assessment.

   The staff assessment looking at the effects of including the plant-ingestion pathway is based upon using the same model inputs as that used by Cabot, with and without the soil cover, and inclusion of the plant-ingestion pathway. A key assumption in such an analysis is the environmental availability of the uranium in the environment (U-238 progenies are the prime contributors to the calculated dose). Because incorporation of uranium in food involves uptake of uranium by plants from an aqueous solution, the plant ingestion pathway assumes that the uranium is soluble. NUREG/CR-6232 (Amonette et al., 1994) suggest that doses for both soil ingestion and plant ingestion should be calculated on the basis of the total available uranium instead of total uranium. Because the total available uranium has been determined to be only a small fraction of the total uranium within the slag, the resulting doses should be only a fraction of the calculated dose based upon the total uranium. Therefore, Cabot may want to consider using the total available uranium in assessing potential doses from any ingestion pathways.

4. Given that the latest version of the RESRAD code (i.e., version 6.0) is readily available for downloading from the Internet, Cabot should use the latest version of the code for conducting any additional analyses in support of demonstrating compliance with the license termination rule. Several changes to recent updates of the code could specifically affect the calculated results for the Cabot-Revere site, these would include:

(1) incorporation of a new area factor model for inhalation, (2) changes in the default mass loading factor, and (3) incorporation of a time integration routine for calculating doses.

5. In the radiological assessment, Cabot states that use of the measured gamma readings as oppose to calculating them with RESRAD, results in estimated external doses that are roughly a factor of three less. Given that the doses calculated by RESRAD assumes uniform contamination, this would suggest that either the estimated concentrations used in the analysis are too high or most of the radiation is in the subsurface. As part of their characterization, Cabot dug a number of pits and trenches on-site, but they apparently do not have a reliable estimate of average subsurface concentrations. The assumption of homogenized contaminated media assumed in the RESRAD calculation would appear to be consistent with the modeling assumptions used for the analyzing the other exposure pathways. Further, there is no reason to believe that the contaminated media will not be disturbed (i.e., homogenized) at some time in the future. To support the use of the gamma measurement readings to estimate external doses, Cabot needs to clarify the assumptions of the analysis; that is, whether or not a concentration gradient is assumed. If the primary radiation is assumed to occur in the subsurface, Cabot needs to explain why it is appropriate to assume that these conditions will be maintained throughout the assessment period without land-use restrictions. Further, Cabot needs to explain how this assumption is consistent with the approach used to analyze doses for the other exposure pathways. As an alternative to supporting the use of the gamma measurement readings, Cabot can use RESRAD to calculate doses from external gamma radiation. This may necessitate reassessing the concentrations used in the assessment.